

# **MARATHON ASHLAND PETROLEUM LLC ULSD TESTING**

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# Distribution Concerns

- The distribution system has no experience in handling ultra low specification product in a batched system
  - Off-highway /heating oil <5000 ppm
  - Jet Fuel <3000 ppm
  - Low sulfur diesel <500 ppm
  - Kerosene <2000 ppm
  - Ultra low sulfur diesel ,15 ppm



# Goals for MAPL ULSD Testing

- Determine whether sulfur from other refined products will “trail-back” in the pipeline
- Determine what batch sequences will work and the amount of interface generated



# Goals for MAPL ULSD Testing (Con't)

- Determine sulfur degradation due to:
  - The originating tank and receipt manifold piping
  - The pipeline and its associated appurtenances
  - The delivery manifold, tank piping and transport loading equipment
  - Pipeline shutdowns
- Determine an appropriate field test for sulfur

# ULSD Testing

- Initial tests conducted with Premium Gasoline on 4 pipeline systems
  - Many lessons about contamination learned
- ULSD tests were conducted on 4 pipeline systems
  - Garyville tests were the most recent
  - Garyville test was representative of all tests
  - Test covered movement from Garyville refinery tankage to MAP's tankage at Zachary, La

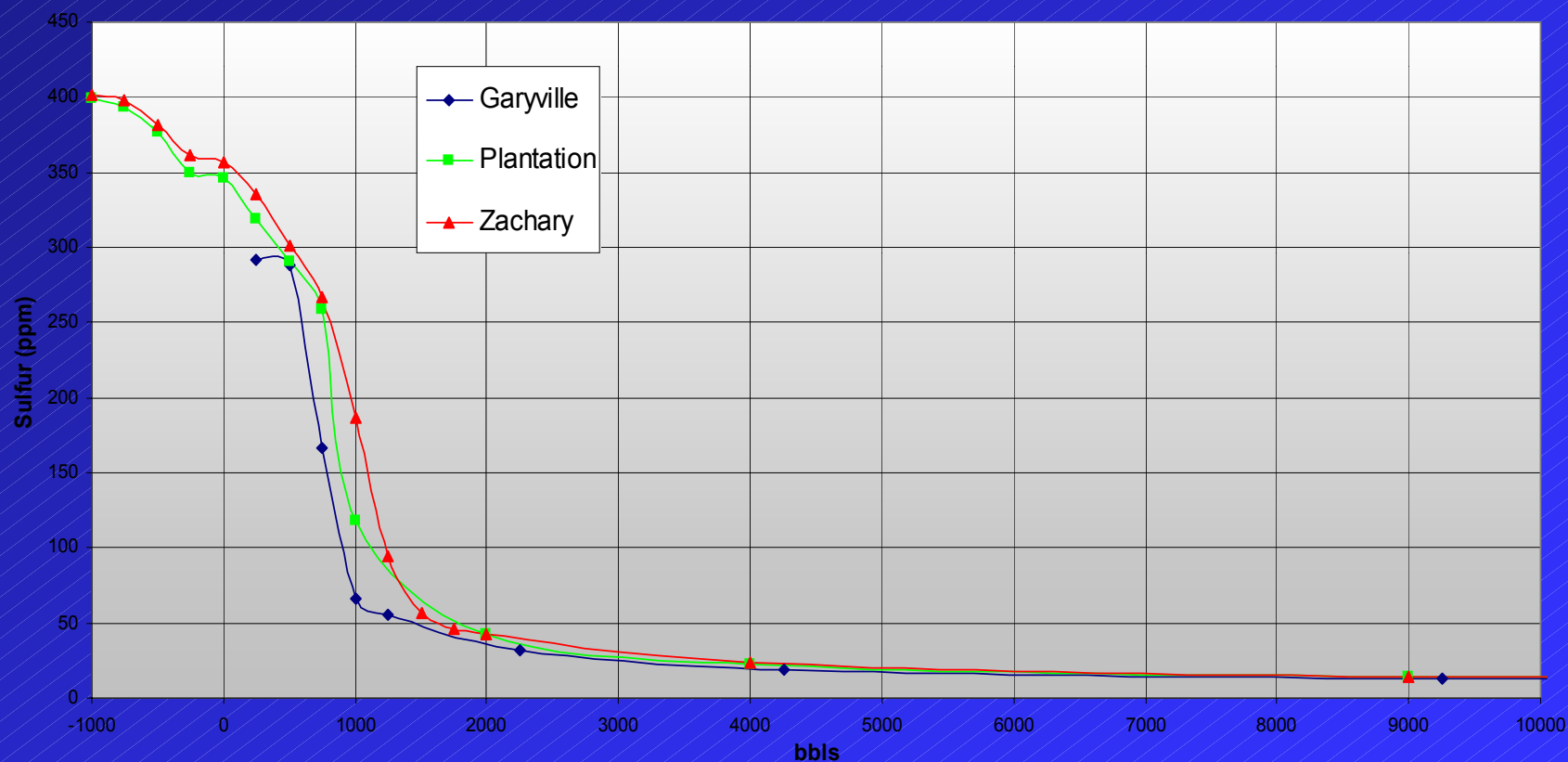


# ULSD Testing – Garyville to Zachary

- Garyville made 90,000 bbls of ULSD in mid-September, 2001
  - ULSD in tank had 10 ppm sulfur and API gravity of 38.7 degrees
  - ULSD from unit had 7 ppm sulfur
- 76,500 bbls lifted to Zachary
  - LSD at head end
  - Regular gasoline at tail end

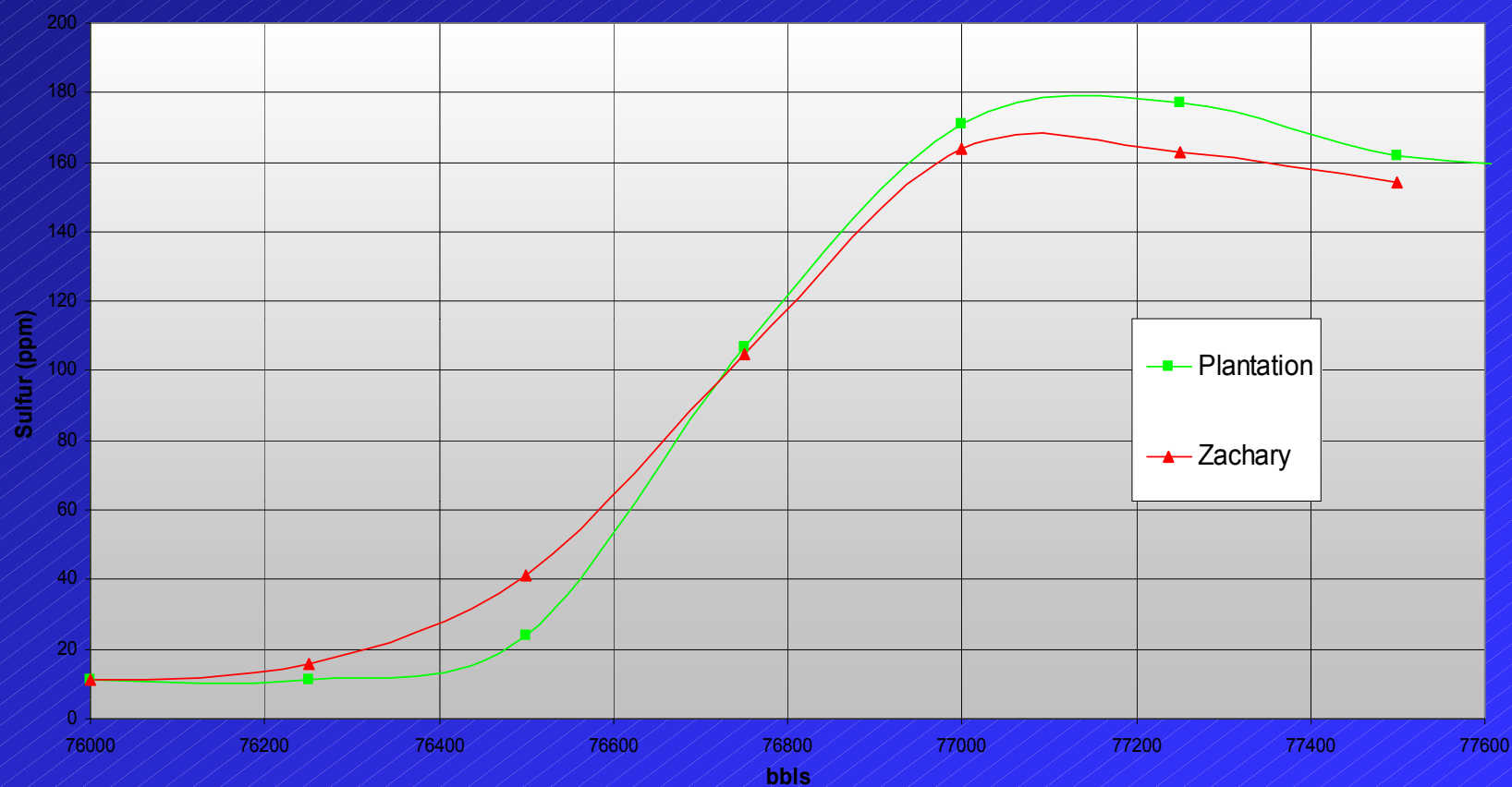
# ULSD Testing – Garyville to Zachary Results (Con't)

Garyville to Zachary Head End Expanded Sulfur Profile  
(9/15/01 - 9/16/01) Chart 2



# ULSD Testing – Garyville to Zachary Results (Con't)

Garyville to Zachary Expanded Tail End Sulfur Profile  
(9/16/01) Chart 3

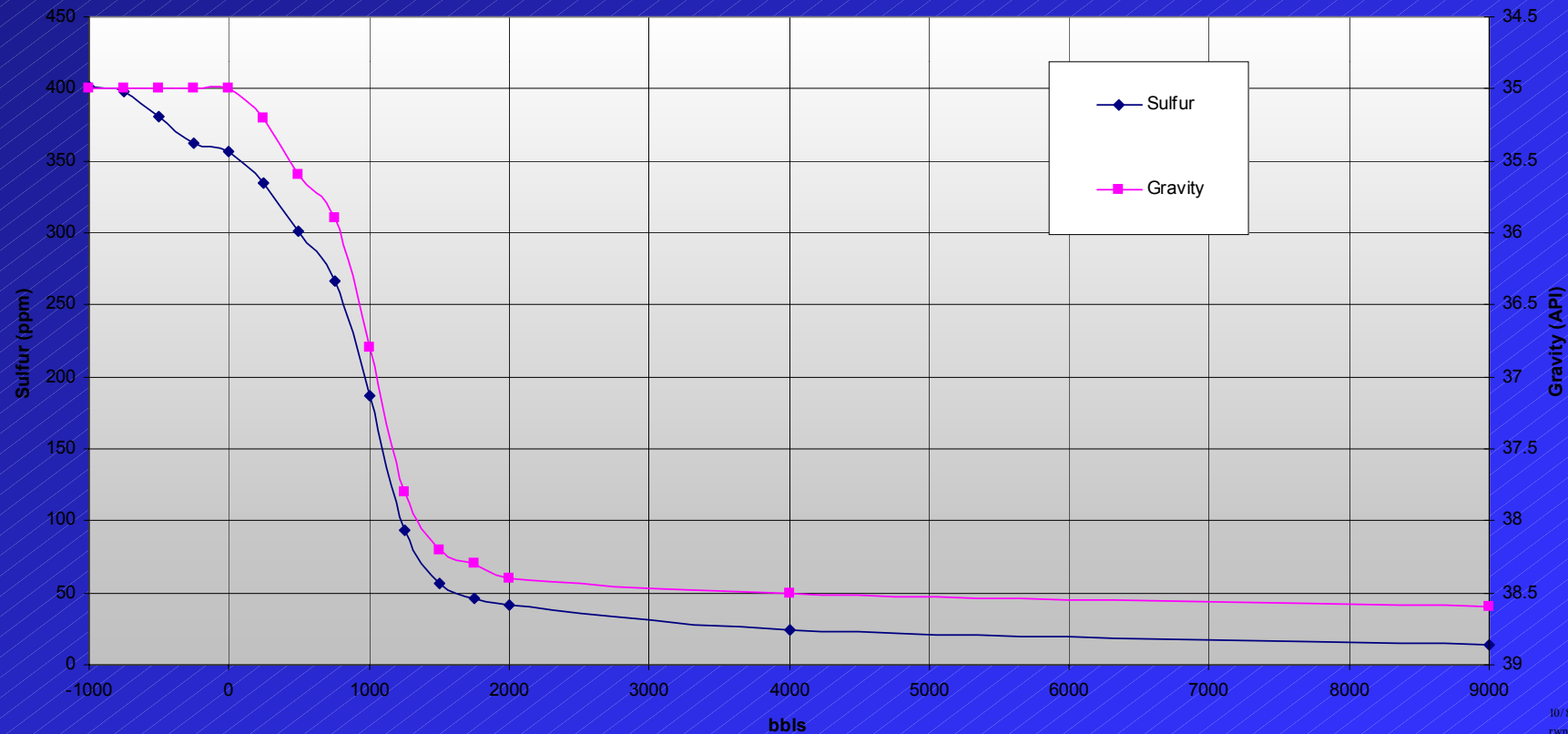






# ULSD Testing – Garyville to Zachary Results (Con't)

Zachary Head End - Sulfur & Gravity Profile  
ULSD Batch - 9/16/01 - Chart 6





# ULSD Testing – Garyville to Zachary Results (Con't)

- **Zachary via 20" system wrapped with LSD and gasoline**
  - 73,034 bbls out of 76,588 bbls delivered to a clean tank at Zachary
  - 1-2 ppm sulfur degradation tank to tank
  - 4.6% loss to interface
  - Refinery tank line at Garyville contaminated head end 4000 bbls
  - No migration of sulfur at head end or tail end beyond the normal gravity interface zone
  - No degradation due to the pipeline and associated appurtenances
  - No sulfur degradation from delivery piping

# Testing Summary

- **MAPL results indicate:**
  - **Pipelines can transport ULSD and maintain the sulfur specification**
  - **Gravity changes correspond closely to sulfur changes; protective gravity cuts should be acceptable**
  - **The loss to interface should be the same as with current critical cuts**

# Testing Summary (Con't)

- **MAPL results indicate:**
  - Contamination occurs from front end systems such as refinery piping and origin station piping
  - Little sulfur contamination occurs in the pipeline
  - Tankage and delivery system piping does not add significant sulfur contamination

# Testing Conclusions for MAP

## ■ Concerns for pipeline operators:

- Pipeline ULSD sulfur specifications could vary by batch depending on the routing
  - Simple refinery to terminal movements will add 1 about ppm sulfur and will lose about 3% to interface every time a batch is moved through tankage
  - More complex network routings could add several ppm sulfur and could have larger losses to interface
- Each pipeline system will have its own “personality”
  - Anything which creates a product quality problem today will be exacerbated when handling ULSD
  - Pipeline ULSD sulfur specifications could vary by system



# Testing Conclusions for MAP (Con't)

- **Concerns for pipeline operators:**
  - **Must have in-line sulfur testing equipment**
    - Control contamination that happens during transit
    - Help defining cut points
    - Suitable sulfur testing equipment is not currently available
  - **Need to redesign terminals and facilities to minimize contamination**
  - **Downgraded diesel interface/transmix will have to be moved to a refinery or to a pipeline system that handles HSD**
  - **The ability to carry a 2<sup>nd</sup> grade of highway diesel will require new pipeline breakout tankage and new destination terminal tankage**